

# **Energy Efficiency: A Key to Getting Out of the Greenhouse**

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For the League of Women Voters Meeting  
Albany, California, December 4, 2007

## Are Frogs Smarter than Humans?



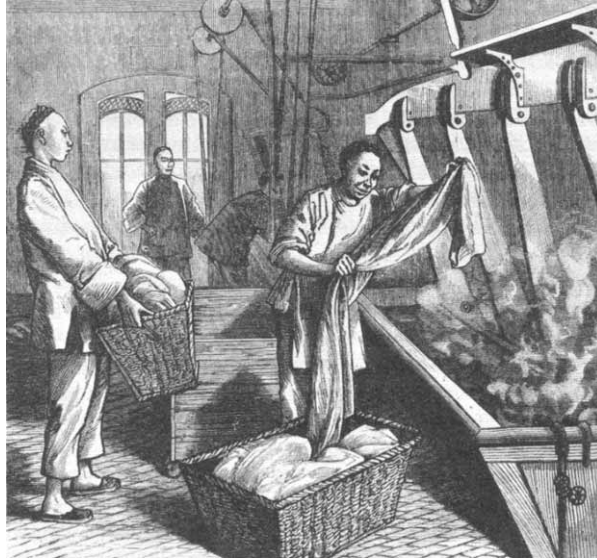
Everything can always be  
done better than it is.

- Henry Ford

The Kakelung: Product of an  
Early Energy Crisis in Sweden

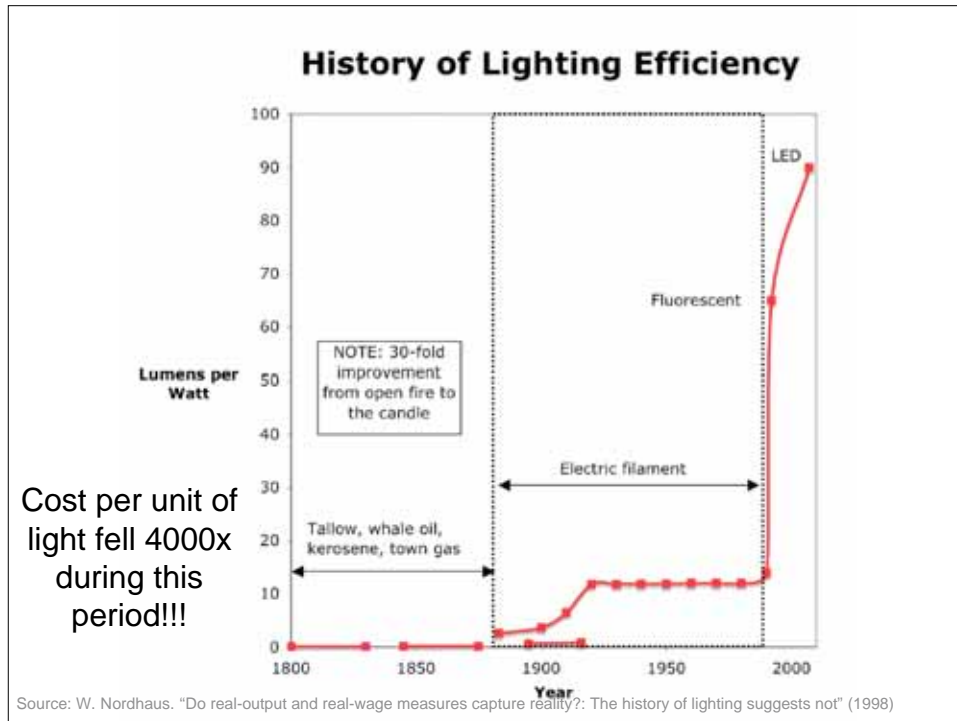


Today's washer-dryers 100x more efficient than coal-fired laundries

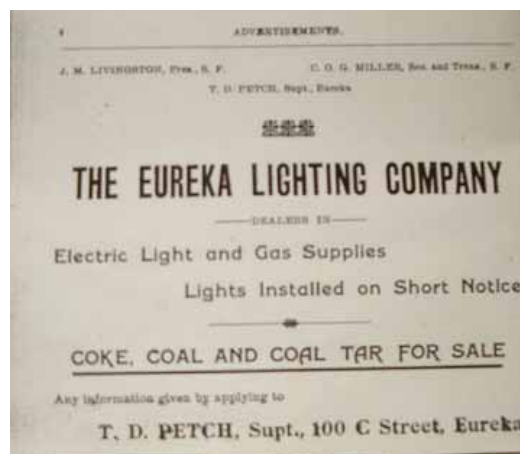


Efficiency is Competitive

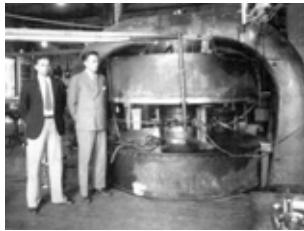




## Energy Services

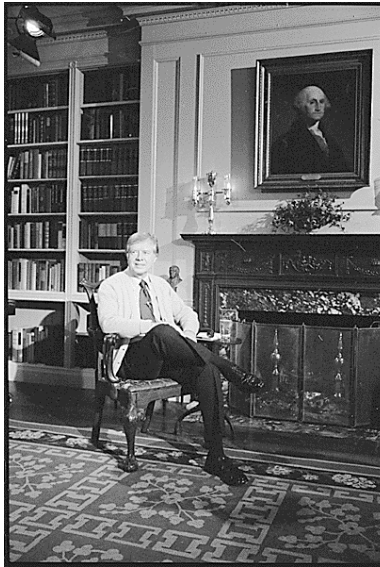


## Use of LBNL's Bevatron Was Once Constrained by Inefficiency



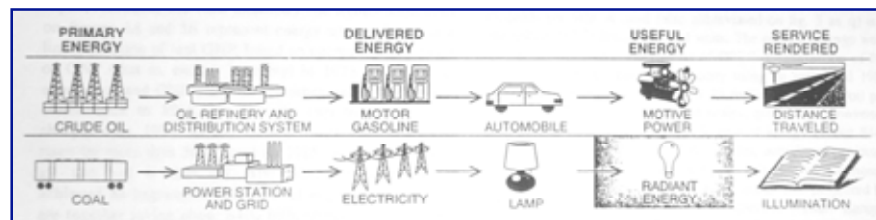
## Autonomous Energy Efficiency





President Carter's (in)famous "Fireside Chat" on Energy - February 2, 1977

## Energy Services

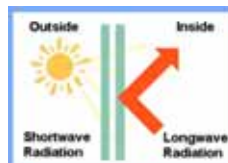


## Potent Analogies, *ala* Rosenfeld



Rate of heat loss from US windows = rate of energy flowing through Alaska Pipeline

## Potent Analogies, *ala* Rosenfeld



Offshore Oil Rig:  
\$300 million

=

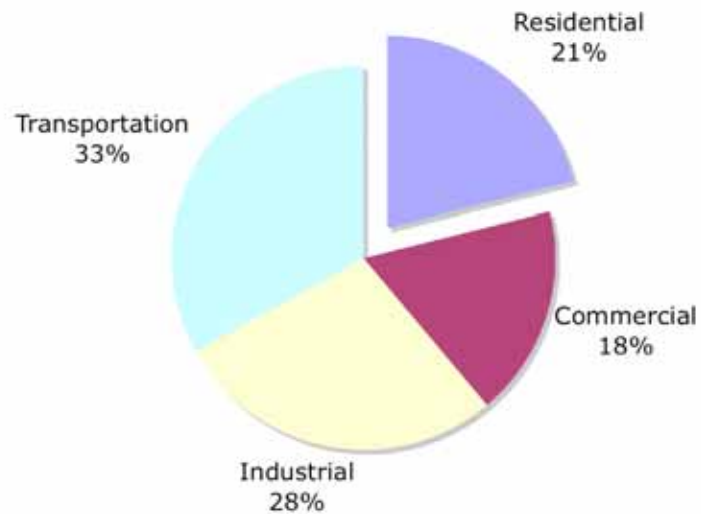


Low-E Window Plant:  
\$6 million



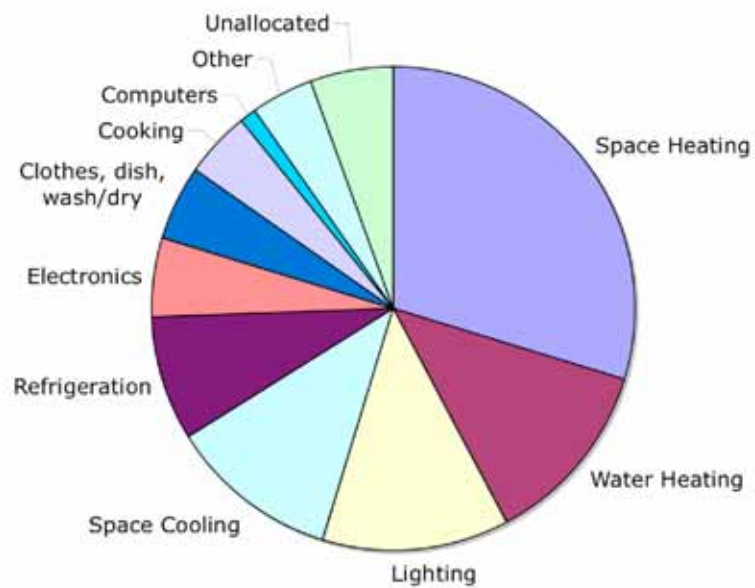
### US Carbon Dioxide Emissions: 2005

1.6 billion Tonnes Carbon



US Department of Energy, Energy Information Administration

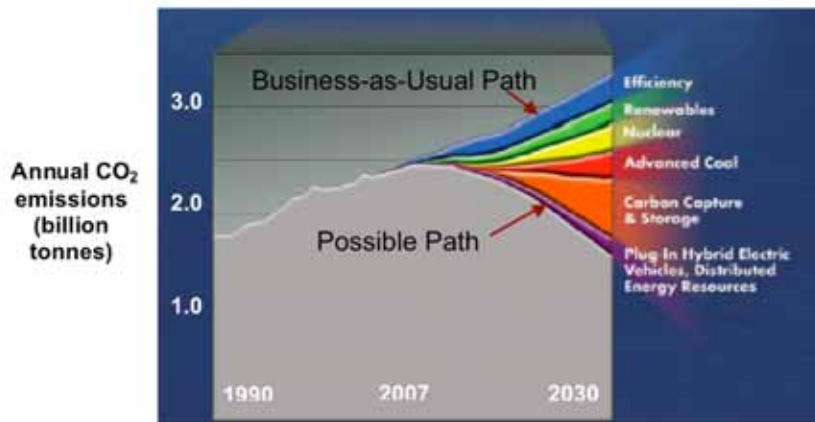
### Carbon Footprint of US Homes, 2005: 329MT





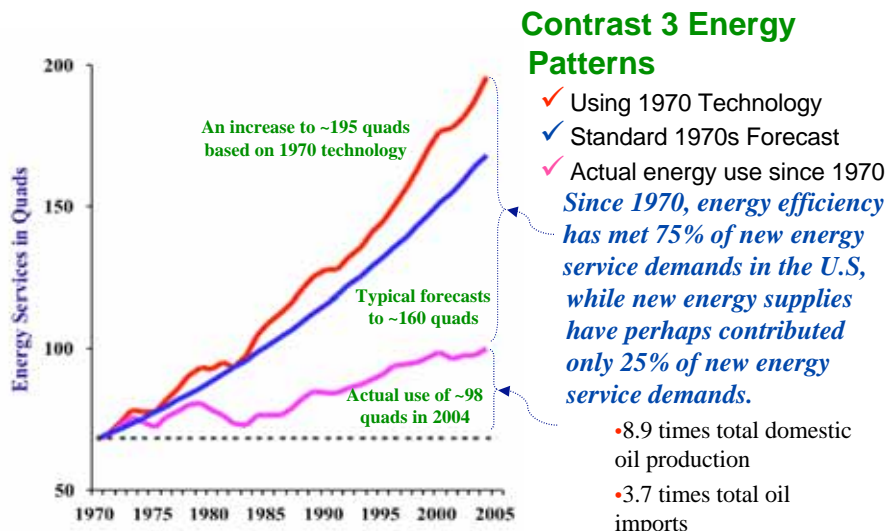
# Growing the Economy While Reducing Emissions

U.S. Electricity Sector Carbon Dioxide Emissions Reduction "Aggressive but Feasible" Scenario



Source: Electric Power Research Institute, i.e. a conservative view...

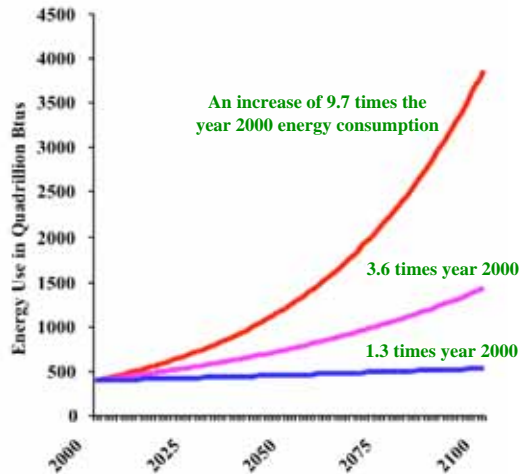
## Without New Efficiency Technology,\*\* Energy Use Would Be Almost 3 Times 1970 Levels



\*\* Where "energy efficiency" is broadly defined as the difference between the 1970 and 2004 energy intensities.

Source: Skip Laitner

## Without New Efficiency Technology, Energy Consumption Will Increase Significantly



### Contrast 3 Scenarios

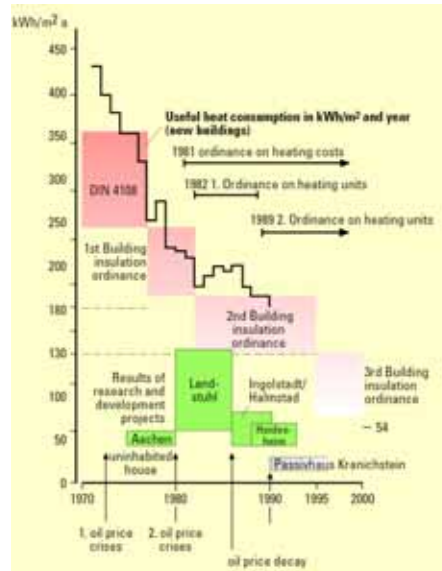
- ✓ Using Year 2000 Technology
- ✓ Assuming a standard 1% Annual Rate of Improvement in Energy Efficiency
- ✓ Assuming a 2% Annual Rate of Improvement in Energy Efficiency

Where each scenario assumes a 2.3 percent level of worldwide economic growth (in GDP) over a 100-year period, but employs a different mix of technologies and efficiency improvements.

Source: Skip Laitner

## The “silent efficiency revolution”: Development of useful heat consumption in *new* buildings in Germany

- 75% reduction in heating energy needs over just 30 years.



## Low-Hanging Fruit



Outdoor lights on during day at school in Mexico....

## Greening of the Capitol



"Today we say that the Capitol will be not just a shining symbol of our democracy, but a symbol of our commitment to the future. Not only by the power of our ideas on energy independence, but by the power of our example, we hope to send a message to the world and to the country."  
- Speaker Pelosi, June 21, 2007

Green the Capitol Initiative



Source: <http://cao.house.gov/greenthecapitol/>

## Where does the energy go?

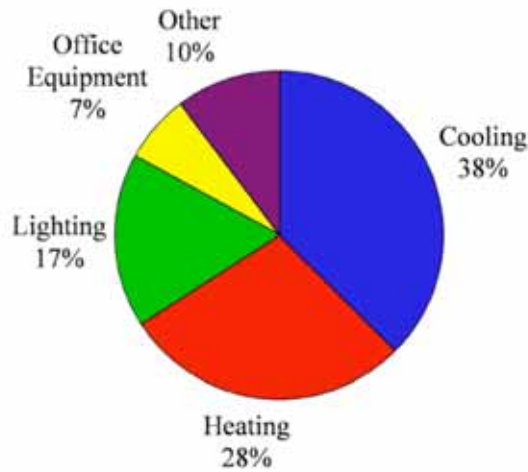


Figure ES-2. Total Energy Use for House Buildings by End Use.

## How much can we cut carbon?



100%: 50% with efficiency; 50% with offsets

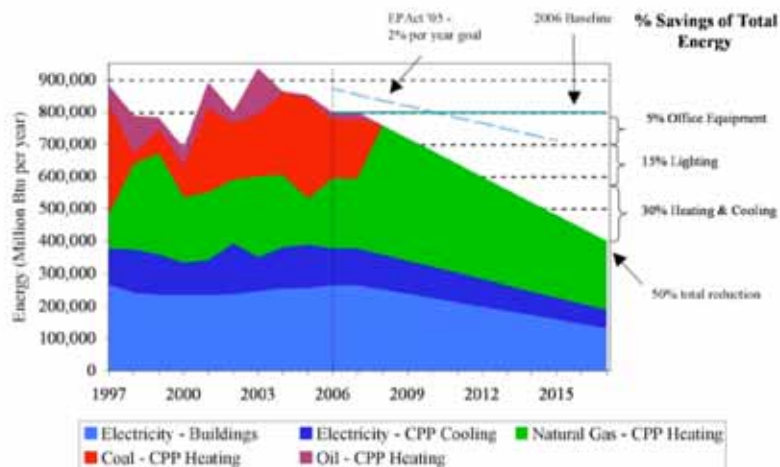


Figure ES-3. Energy reduction scenario for the House attributable consumption due to improved efficiency measures

# Will it cost more? No!

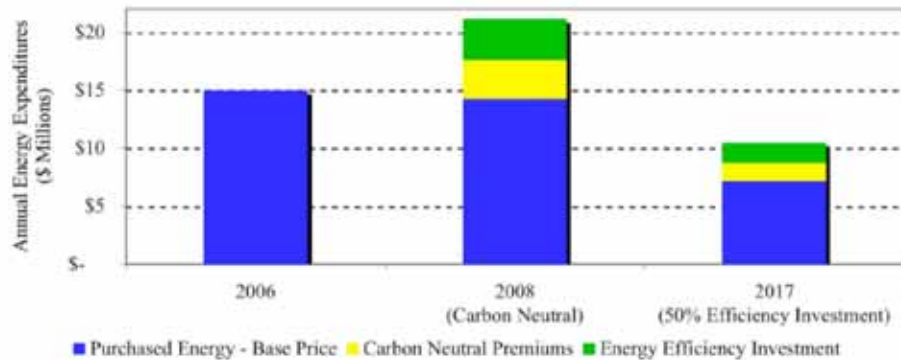
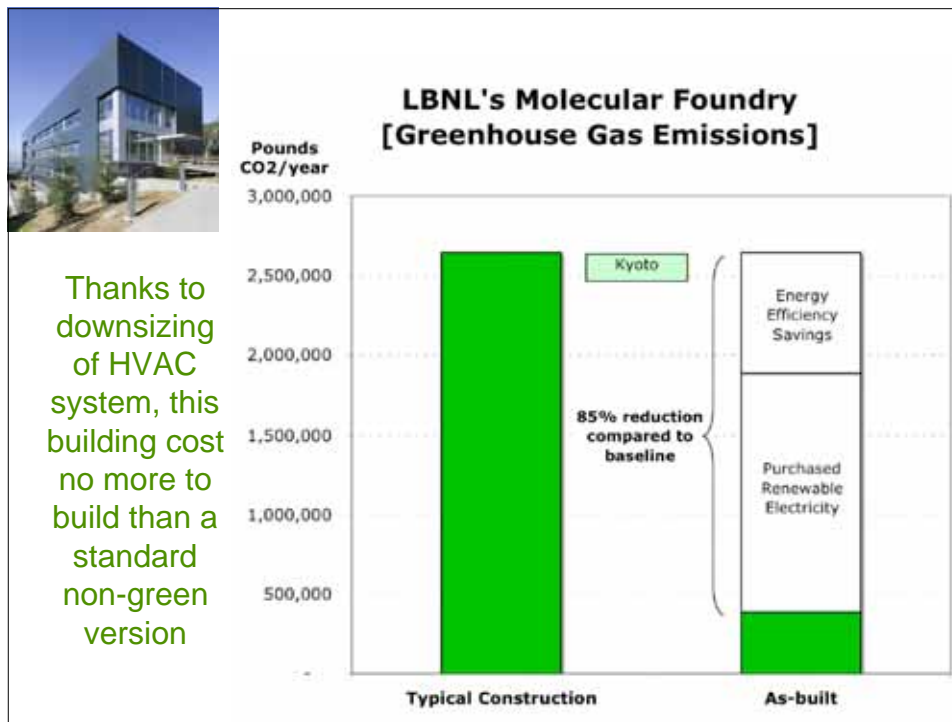


Figure ES-4. Total carbon-neutral scenario costs

## The Molecular Foundry - High-tech can be green





## The Specter of Fuel-Based Lighting





**India:** street vendor (Varanasi)

**“We will make electricity so cheap  
that only the rich will burn candles”**

- Thomas Edison



In the developing world, 14% of urban households and 49% of rural households have no electricity ... (2000 data)

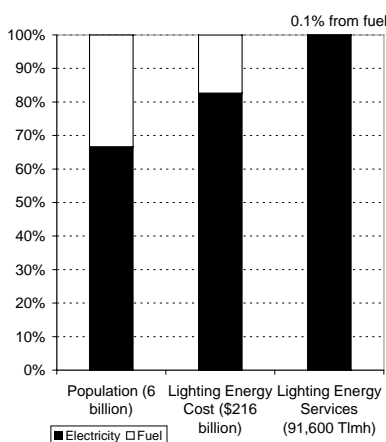


... In fact, there are more non-electrified households today than the total number in Edison's time.



## Lighting Inequities

Although one in three people obtain light with kerosene and other fuels - **paying \$40 billion/year** - about 20% of global lighting costs, they receive only 0.1% of the resulting lighting energy services



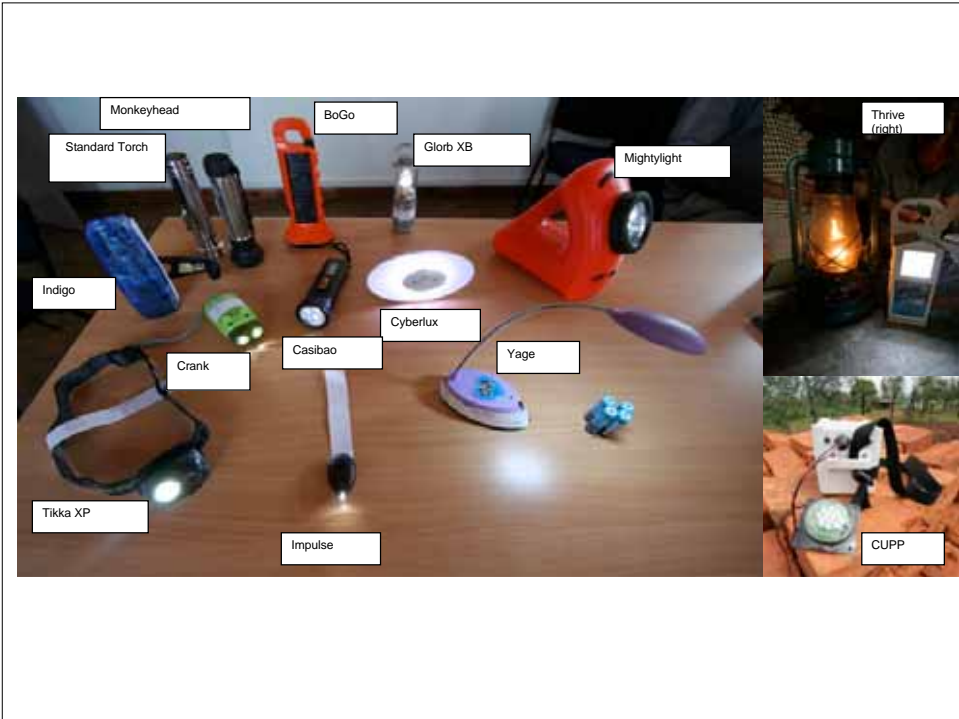
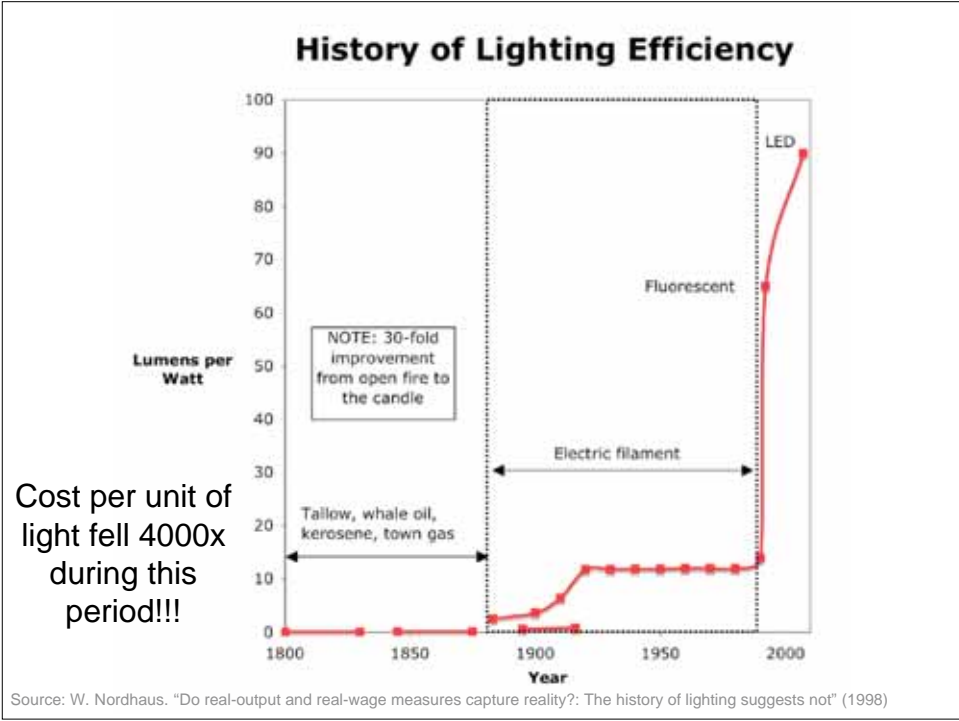
## Studying by roadlight at Guinea airport (80% of population unelectrified)



## **White** Light-emitting Diodes (“LEDs”)

- Efficient
- Long life
- Low voltage
- Directional
- Portable
- Rugged
- No mercury
- Common batteries
- 10-100x the service level of flame light



















**Carbon Footprint of US Homes, 2005: 329MT**

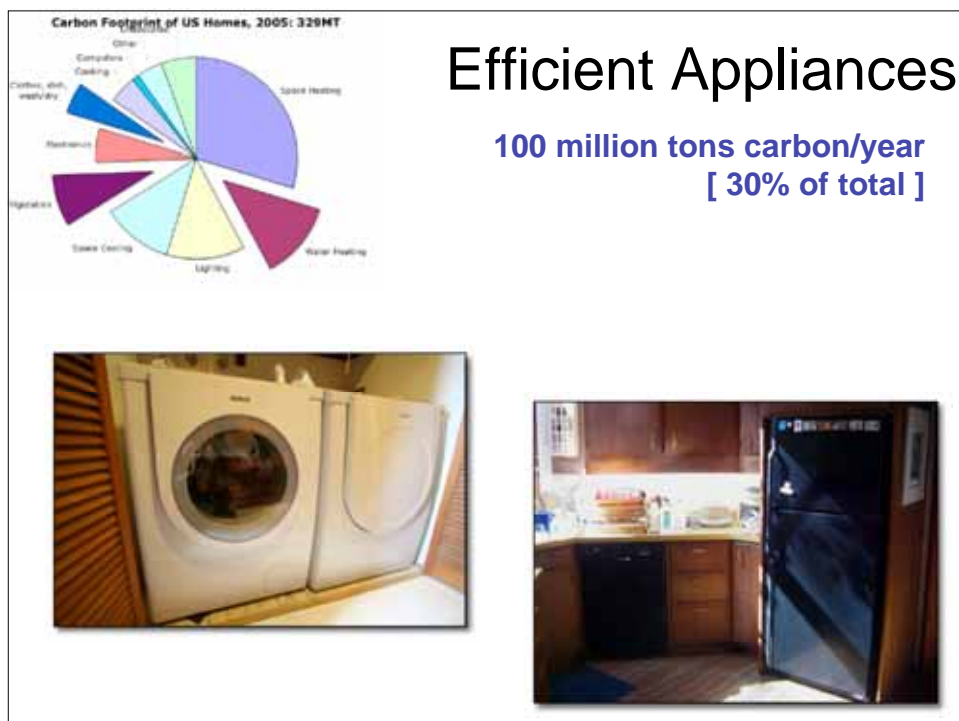
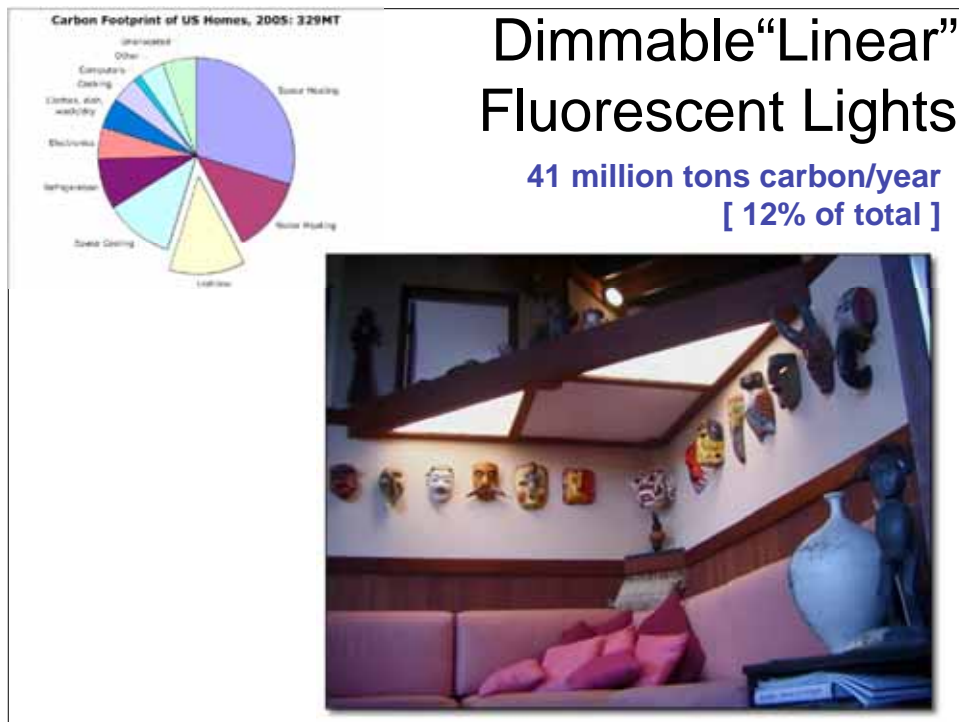
Category	Percentage (approx.)
Space Heating	35%
Water Heating	15%
CFLs	12%
Refrigeration	10%
Electricity	8%
Transportation	5%
Other	5%

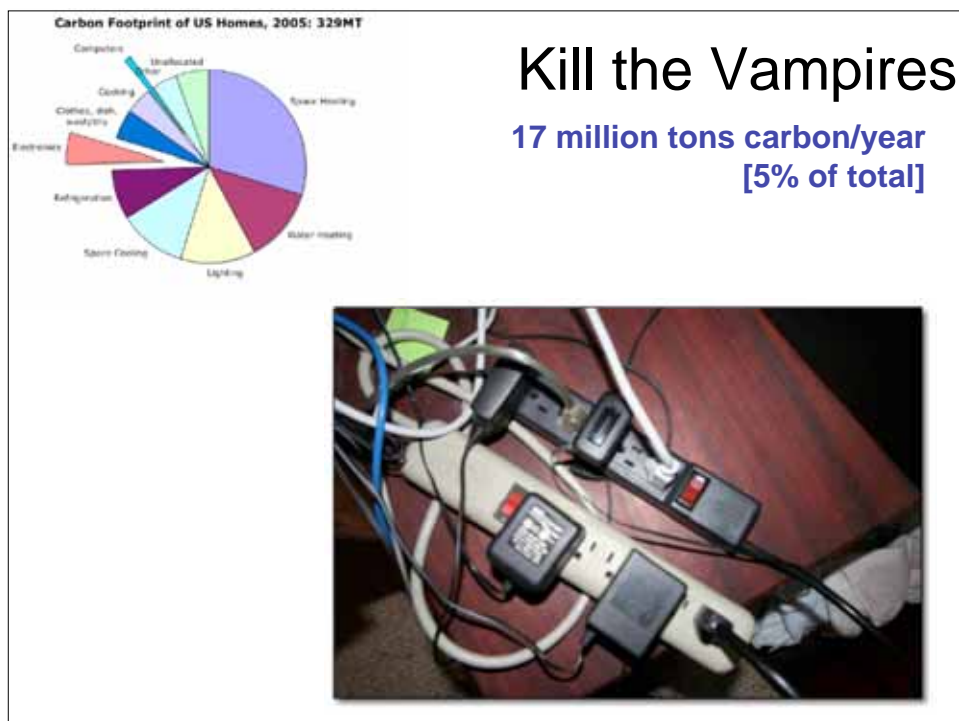
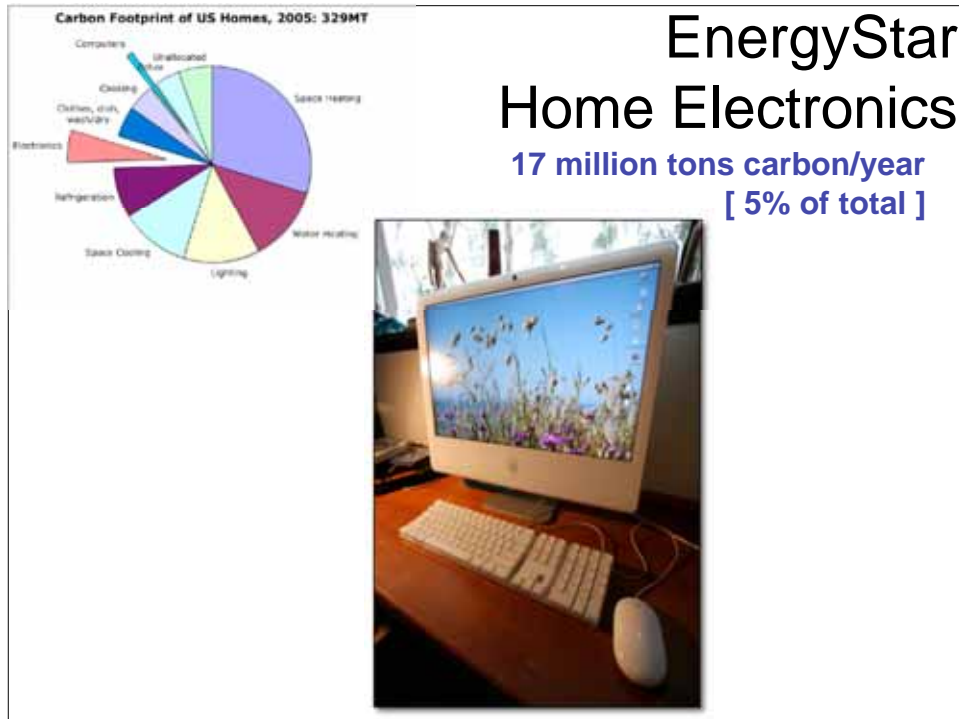
## Compact Fluorescent Lights (“CFLs”)

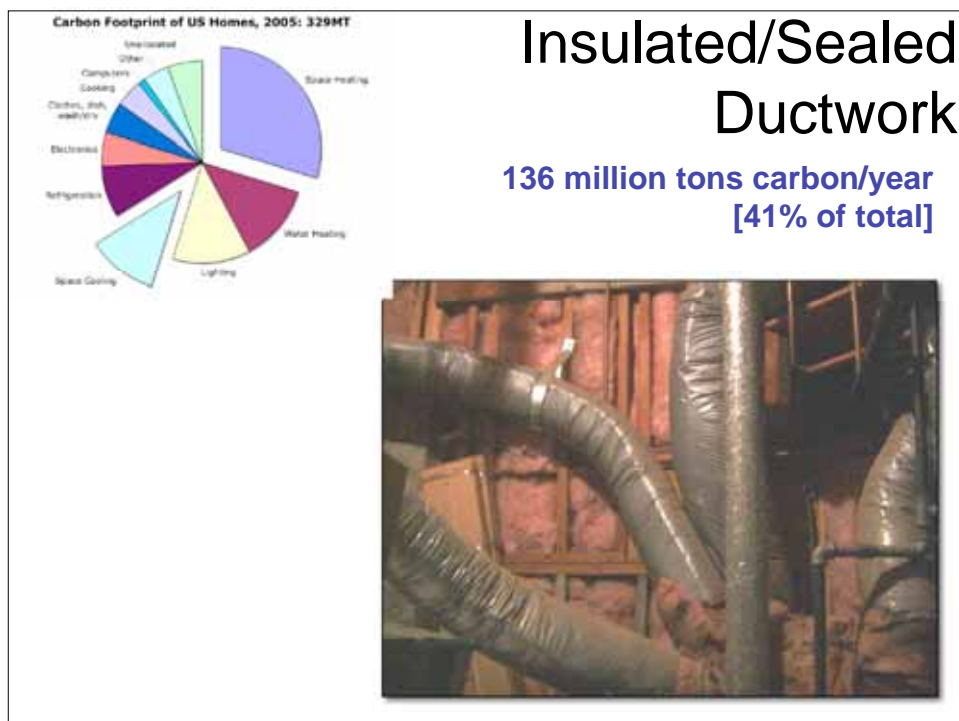
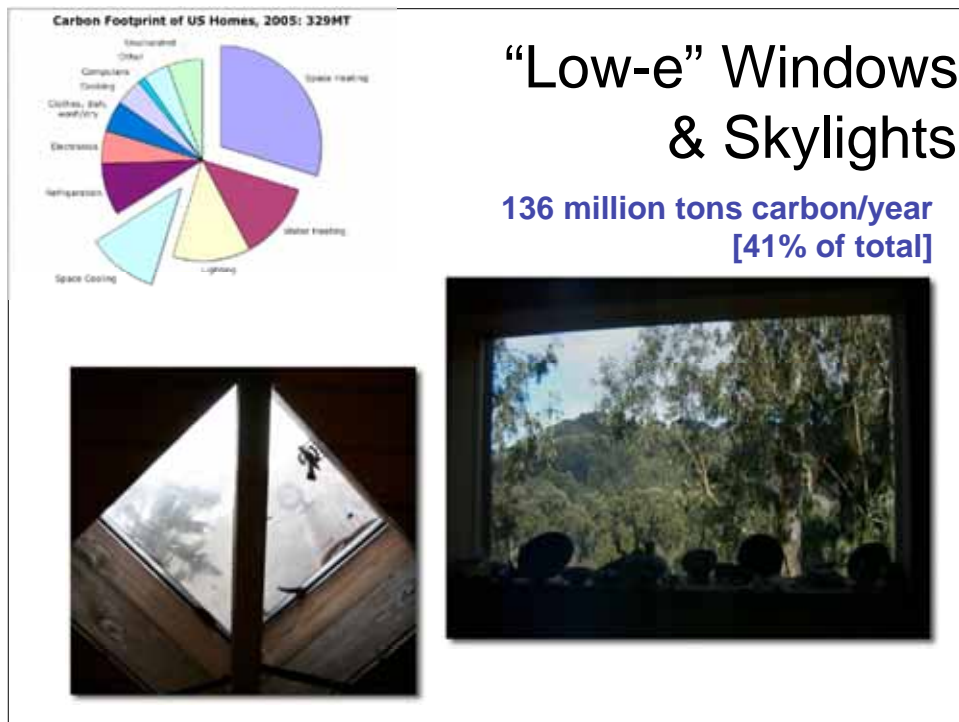
**41 million tons carbon/year**  
[ 12% of total ]









## Time-of-Use (TOU) Electricity Tariff

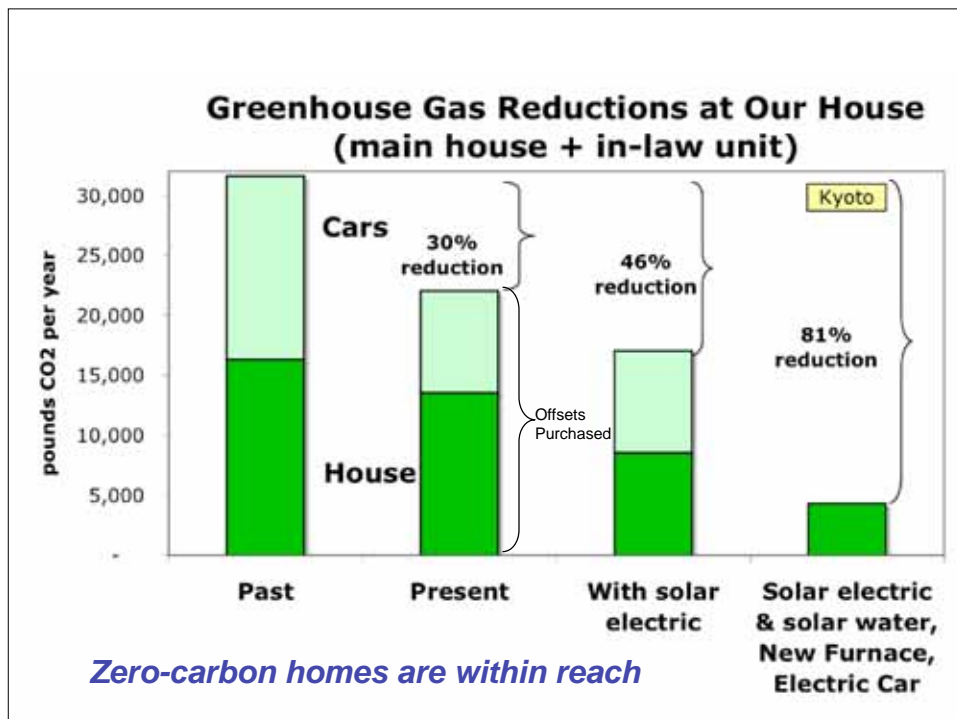
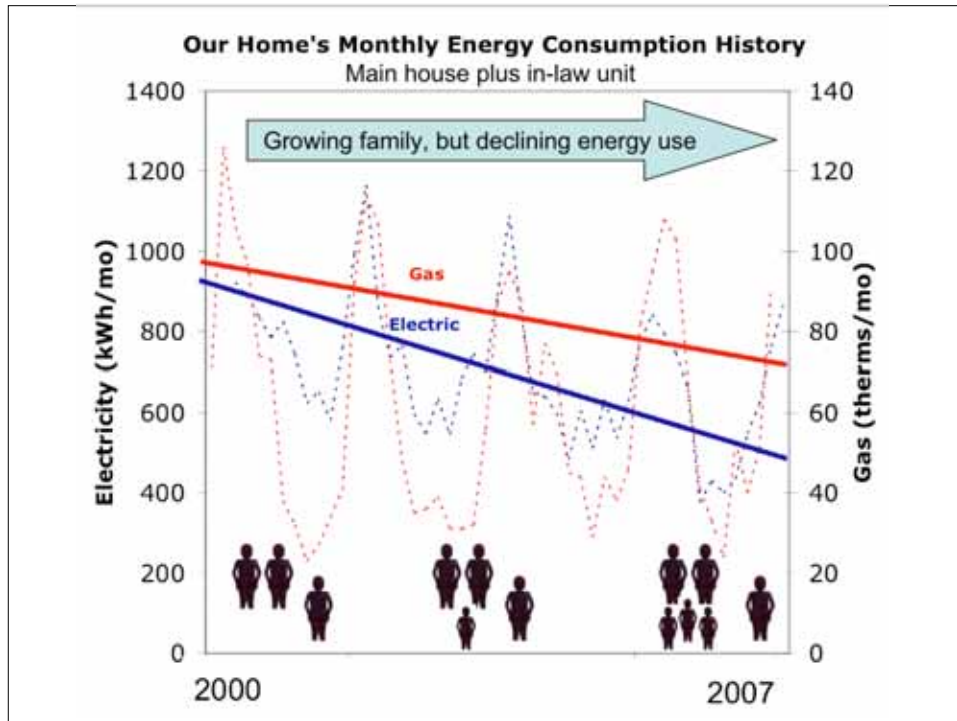
*Advanced digital metering - logs electricity use by time of day and year*

*Encourages use of electricity during off-peak periods; maximizes payments for solar-generated electricity sold back to grid*



## Improved vehicle fuel efficiency [3x savings vs prior vehicle]





## CARBON FOOTPRINT CALCULATOR

Your carbon footprint is: **10,656 lbs. CO<sub>2</sub> per year** (estimated\*)

Equivalent to burning 549 gallons of gasoline

### How do you measure up?

Your footprint: 10,656 lbs.

Average Californian: 22,841 lbs.

Average American: 32,807 lbs.

Average Global Person: 8,750 lbs.

\*Information on how these calculations are made can be found on the last page.

[Re-Calculate](#)

[Continue](#)

Pacific Gas and Electric Company

[your home](#) [your business](#) [CUSTOMER SERVICE](#) [RATES](#)

### Sign Up for ClimateSmart™

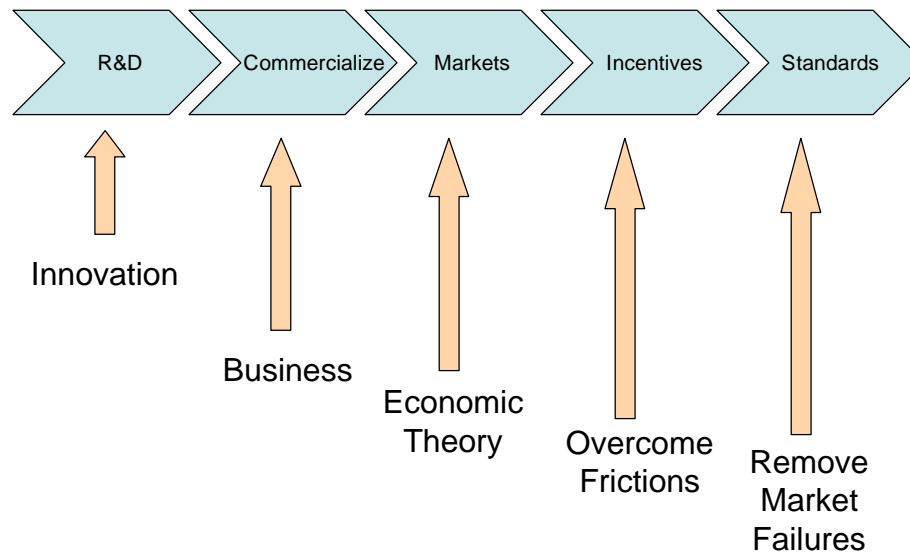
To enroll in this exciting new program, please choose one of the methods below:

- Enroll using My Account  
[Log In](#), click "Billing," then "ClimateSmart" in the left navigation.
- Or, use our easy, secure online form:

Name:		
Phone:	( ) -	-
E-mail:		
Verify E-mail:	<a href="#">Privacy Policy</a>	
Address:		
City:	Zip:	
Account Number (optional):	<a href="#">How to find your account number</a>	
Enroll these portions of my bill:	<input type="checkbox"/> Both <input type="checkbox"/> Gas <input type="checkbox"/> Electric	

(This form is being submitted securely.) [Return to Top](#)

## Making it Happen





## Aligning Terms & Conditions with Risk-reducing Behavior

- Insurance discounts of up to 40% for low mileage:

- **GMAC**
- **Progressive**
- **Norwich Union**
- **Polis Direct**
- **Rheinland**
- **Versicherungen**
- **Aioi**
- **Axa**
- **Hollard**
- **Gerling**
- **Unigard**
- **Sompo and Tokio Marine & Nichido**

250,000 policies  
in Europe as of  
2007. \$700M  
revenues  
projected by  
2010



General Motors Acceptance Corporation (GMAC) PAYD discount schedule.

Miles/year	Discount offered
1 – 2,500 miles	40%
2,501 – 5,000	33%
5,001 – 7,500	28%
7,501 – 10,000	20%
10,001 – 12,500	11%
12,501 – 15,000	5%
15,001 – 99,999	0%

*Some use GPS --> stolen-vehicle recovery; avoids reporting fraud*

## Aligning Terms & Conditions with Risk-reducing Behavior

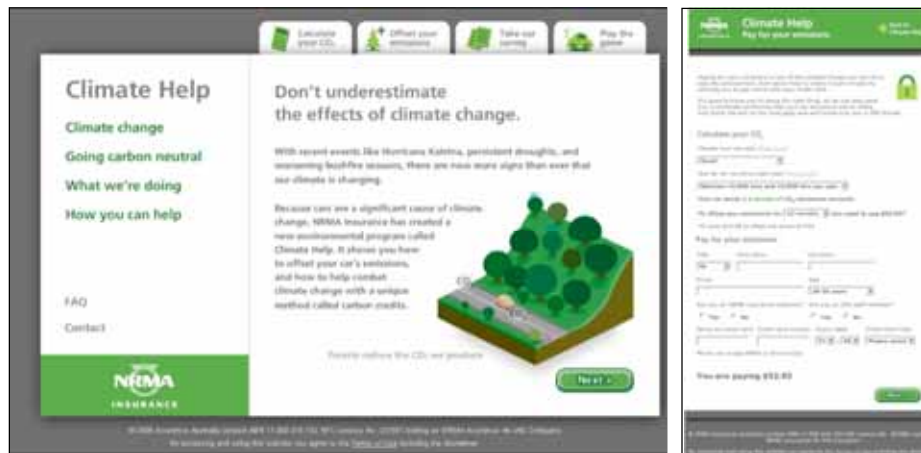
- **Travelers** offers 10% premium discount to drivers of hybrids
- **Swiss Re** - seeking D&O disclosure from insureds





## Innovative Products

- **Insurance Australia Group** offering on-line automobile carbon-offset service for customers



Source: <http://www.climatehelp.com.au/>

## Building Awareness & Formulation of Public Policy

- **American Insurance Association** - Endorsing public transportation; reduced speed limits; telecommuting based on win-win benefits to insurers

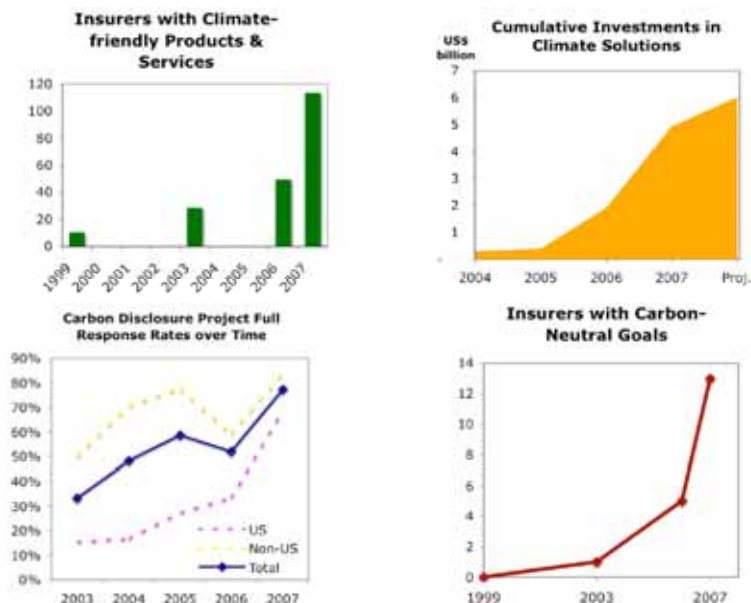


# Innovative Products

- **AIG:** first-ever residential “Green-Buildings” insurance being launched this year
  - Rebuilding to green standards after loss
- **Fireman’s Fund:** first U.S. commercial & residential “Green-Buildings Insurance”
  - 5% premium credits for green features
  - Rebuild green after loss
- **Lloyds of London (Naturesave):** personal lines; commercial lines
  - 10 percent of premiums donated to environmental projects
  - environmental performance surveys offered to policyholders



# Trends



<http://HomeEnergySaver.lbl.gov>

